SUBMISSION NO. 81

AUSTRALIAN COUNCIL OF RECYCLERS INC

the voice of the recycling industry

House of Representatives Standing Committee on Environment and Heritage

Inquiry into a Sustainability Charter

Submission by

Australian Council of Recyclers
May 2006

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1. Introduction to ACOR

The Australian Council of Recyclers (ACOR), established in 1983, is Australia's peak industry association representing companies involved in recovering secondary resources.

ACOR's mission is to *"maximise resource recovery and seek continuous improvement in resource efficiency in accordance with the principles of ecological sustainable development and achieve the highest resource order of Australia's recovered materials".*

Our guiding principles to achieve our mission include:

1. *To encourage governments, industry and the community to take actions that promote resource recovery, recycling and optimise the profitable recovery and recycling of secondary materials.*
2. *To facilitate the removal of barriers to economic and sustainable recycling and promote changes to legislation and government policies where such changes will benefit members*
3. *To encourage uniformity of government policy nationally in relation to resource recovery and recycling and promote policies which are non prescriptive in nature and equitable in outcomes in order to open up opportunities to effectively reintroduce secondary materials for reuse.*
4. *To maximise the opportunity of substituting recycled materials for virgin raw materials and closing the recycling loop through members producing a range of quality recycled raw materials, in accordance with locally and internationally recognised and developed materials specifications.*

In summary, ACOR seeks to encourage governments, industry and the public to take actions that advance the optimal use of Australia's secondary materials and to facilitate the removal of barriers that hinder effective recycling and reprocessing. Through our members reprocess more then 11.3 million tonnes of material and directly employ over 5,000 people in resource recovery activities.

Current ACOR membership spans the following sectors:- aluminium, batteries, cardboard, computers, construction and demolition material, electronics, ferrous and non-ferrous metals, glass, mobile telephones, mobile garbage bins, paper, newsprint, plastics – HDPE, LDPE, LLDPE, PET, PVC , tyres and whitegoods.

ACOR's members include:

ACI Packaging
Alcoa Rolled Products Australia
Alex Fraser Group
AMCOR Paper Recycling
Australian Vinyls
Bluescope Steel
Boral Recycling
Fisher & Paykel
Global Renewables Ltd
Norske Skog
Norstar Recylers
ResourceCo
Sell and Parker
Sims Group
Smorgan Steel
SULO
Visy Recycling.

2. ACOR supports the inclusion of solid waste management as a key element

ACOR welcomes the inquiry and it's terms of reference to develop a Sustainability Charter with measurable outcomes with intermediate milestones for the following key elements in relation to the built environment, water, energy, transport and the ecological footprint.

However, we are disappointed and discouraged that solid waste management is not one of the key elements to be assessed under the Sustainability Charter.

Surely one of the central challenges that sustainability presents to western style economies is how to change the dominant linear approach to production and consumption that results in unacceptably high levels of waste generation and a correspondingly low amount of resource efficiency. We need to move from a "take make waste" or "throw away society" to a "recycling and resource recovery society".

With societies increased prosperity and affluence comes the unacceptably high levels of waste generation and a correspondingly low amount of resource efficiency. It is estimated that in Australia 1.6 tonnes of waste is generated for every person each year. Australia is currently consuming and disposing of over 32 million tonnes of resources annually to landfill and yet solid waste fails to appear as a key element for inclusion and reporting against in the proposed charter.

This Inquiry comes at a time when public interest and support for improved environmental outcomes is high and has the opportunity to improve environmental outcomes while increasing economic output and meeting community expectations through providing guidance and input into policy formulation at all tiers of government.

The Inquiry also offers the chance to put waste management on the national sustainability agenda to deliver resource recovery and efficiency for the long term, a superior option to lurching from one crisis to another as landfill space fills up and communities oppose the establishment of new disposal facilities.

Terms such as 'sustainability', 'sustainable development', 'ecologically sustainable development' (ESD), 'triple bottom line' (TBL) and 'corporate social responsibility' (CSR) have been used (and misused) by corporations, governments and environmental NGOs alike to further their cause. Perhaps the most widely used definition describes sustainable development as meeting current needs without compromising the ability to meet those of the future.[1]

Australia's National Strategy for Ecologically Sustainable Development (ESD) defined ESD as 'A pattern of development that improves the total quality of life both now and in the future, in a way that maintains the ecological processes on which life depends'.[2]

[1] 'Our Common Future' (1987), otherwise known as the Bruntland Report, cited in 'Towards Earth Summit 2002: Briefing Paper', http://www.earthsummit2002.org/Es2002.PDF

[2] Steering Committee for the National Strategy for Ecologically Sustainable Development (1992), - http://www.deh.gov.au/esd/national/nsesd/strategy/index.html.

It is generally agreed that sustainability encompasses the three core elements of environment, society and economics as shown in the figure below.

There are few who would argue that we live in a sustainable society. Many changes need to be made by business, governments and individuals before accelerated progress to this goal can be realised.

The current sustainability agenda is driven by 'crisis management' events of global warming. The majority of debate within this agenda surrounds not whether change needs to occur (this is a given), but the targets and methods (or pathways) for meeting these targets.

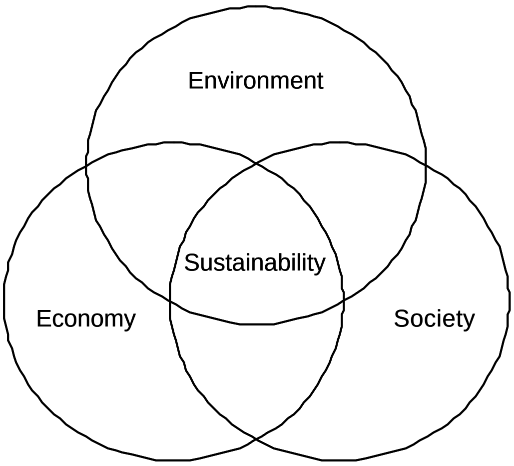


Figure – Main elements within the sustainability concept

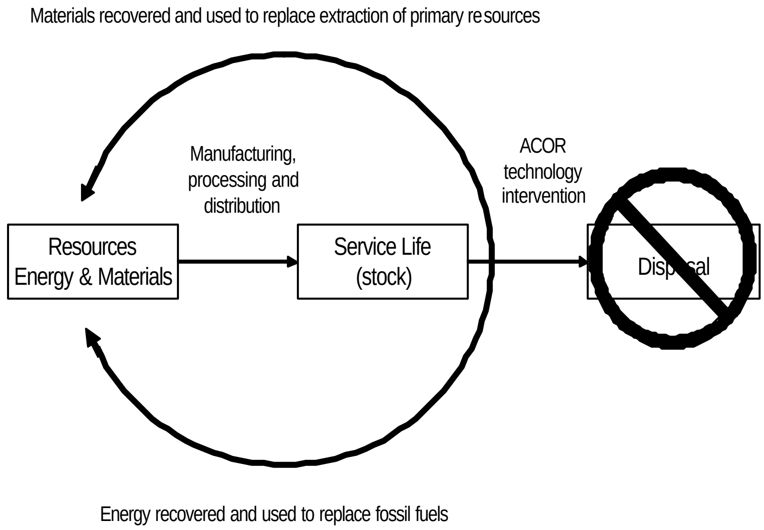
One of the central challenges that sustainability presents to our western economies is reducing the unacceptably high levels of waste generation and a correspondingly low amount of resource efficiency. This comes as a result of there being very little understanding or linking of resource recovery to the volume of new materials and products being generated.

One way to operationalise the principles of sustainability is to use nature as a model when designing systems of production and consumption. This is also known as biomimicry, which is the design of products and processes on the basis of understanding the functions of natural organisms and ecosystems and applying these lessons to the mode of manufacture and operation of the product.

Industrial Ecology applies these biomimetic principles on a macro scale, and provides a framework based on the operation of natural systems to both assess the impacts of industry and technology on the environment, and to design industrial systems that reduce these impacts. For example, the modification of manufacturing processes and the development of new businesses so that residues from one manufacturing operation are used as material inputs for another. Under this approach, as in nature, there is no room for disposal. Disposal is an indication of poor system performance and is ultimately unsustainable.

Implementing 'nature as model' thinking and completing the move to cyclical patterns of production and consumption requires a technology intervention to convert end-of-life 'wastes' into material and energy products ready to be assimilated back into the economy, as shown in the figure overleaf.

In Australia these technology interventions are provided in the main part by ACOR members.



In order to maximise resource recovery and achieve the highest resource value of Australia's secondary materials, an increasingly sophisticated system of 'reverse distribution' is required. This system in turn needs appropriate policy settings, planning for and provision of infrastructure and elimination of market failures arising from externalised costs that provide an unwarranted competitive advantage to disposal options.

3. ACOR supports a National Resource Recovery Target

To date there has been a fragmented response to waste policy issues by Australian governments, with differing levels of service delivery amongst almost 700 local government authorities, varying targets and regulation amongst states and territories and no current national coordinating strategy.

Furthermore, while some state agencies are developing sophisticated yet sensible approaches to the sustainability challenges modern day society present (for example greenhouse issues), there are other instances where departments avoid engaging with the complexity of the sustainability debate (for example over simplification in waste regulation). There are also instances where state departments work at cross purposes to others, for example infrastructure planning and waste policy.

This lack of coordination directly undermines opportunities to maximise resource recovery and improve the resource efficiency of Australian society as a whole. A new approach is needed to consolidate gains made to date and to further accelerate progress in resource recovery and resource efficiency.

ACOR is calling for a National Resource Recovery Strategy, as opposed to waste management and disposal strategies, that seeks to maximise the recovery of resources while continuously improving resource efficiency. This National Strategy requires improvements in the measurement of resource efficiency at a national, state and local level to move beyond a measurement based on waste disposal from a single product or commodity stream.

Resource efficiency could then be used to measure progress towards sustainable resource recovery and to identify where improvements in recovery amounts, levels of recycled content and phasing out of disposal options for certain products and material streams should be made, in line with the goal of continuous improvement.

Appropriate advisory bodies should also be developed to allow governments to effectively engage with the resource recovery industry and gain advice on improving the recovery of certain materials.

Importantly, a national strategy will ensure a unified response across Australia, ideally with standardised waste regulations that are applied across the board with no exceptions for 'small sized' operations that exploit loopholes to operate with no licences. This will assist in keeping the associated costs of resource recovery, for example licensing and reporting, to a minimum.

Each state and local Resource Recovery Strategy would then fit under this overarching document and clearly articulate the integration of planning, infrastructure provision and service delivery with a economic model that promotes triple bottom line outcomes for the community.

The strategy would include key performance indicators including targets, milestones and penalties for non achievement of agreed parameters overseen by the Australian Sustainability Commission.

Currently we have state governments each trying to outbid the other in relation to the targets set and agreed for diversion to landfill. NSW 69% by 2014. Victoria 75% by 2013. However, the waste strategies will fail to deliver as the strategies lack implementation plans, provide no penalties for failure, have little engagement with the private sector and are thus only a number on a piece of paper.

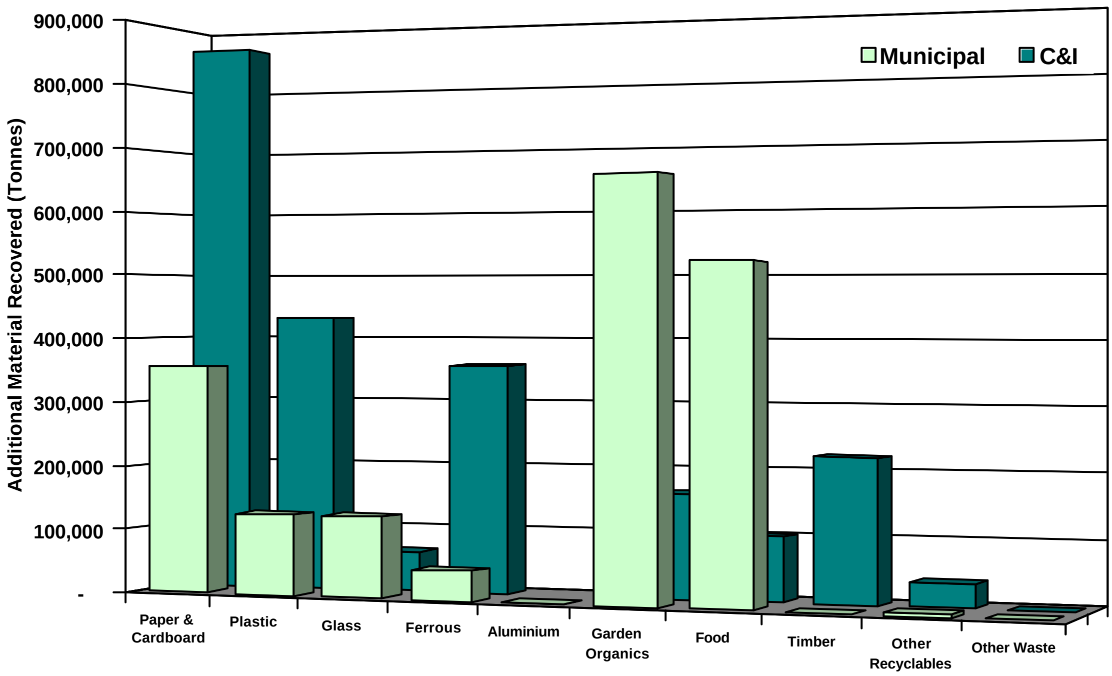
It is the private sector who must invest in infrastructure to deliver against the strategies and make the vision a reality. Yet there is little or no government support or assistance in planning and siting of resource recovery facilities, funding of research and development programs to assist in developing sound business cases for investment or regulatory support for managing problematic and household hazardous waste flows affecting greater resource recovery.

In NSW the State Waste Strategy has set the following rates for waste diversion by 2014:

- Municipal waste 63%
- Commercial and industrial waste 63%

This Strategy assumes no growth in waste generation however based on projected population increases and GDP growth the total municipal quantity to be managed is likely to be over 4.5 million tonnes by 2014 requiring an annual recovery of over 3 million tonnes pa from a baseline of 1,156,000 tonnes in 2002/3 when the strategy was created. The commercial and industrial sector is expected to grow to 5.7 million tonnes requiring recovery of 3.6 million tonnes from a baseline of 1,365,000 tonnes in 2002/03.

The achieve the strategy targets over 4 million tonnes of resources are to be recovered annually by 2014. A chart showing the additional tonnage by material from each waste stream is provided overleaf.



The Victorian government *Towards Zero Waste Strategy* sets the ambitious target of 75% diversion of waste from landfill by 2013 from the current 48% and outlines its goals as:

- Increase materials efficiency and reduce waste generation.
- Increase the sustainable recovery of materials for recycling and reprocessing.
- Reduce the environmentally damaging impacts of waste.

South Australia Waste Strategy 2005–2010 articulates its mission as *"to change the direction of waste management in South Australia to one that meets both the preferred approach of the waste management hierarchy and the principles of ecologically sustainable development".* Targets have been embedded in the strategy and milestones set. Refer table below:

South Australia Waste Strategy 2005–2010 Milestones and Targets

	By 2005	By 2007	By 2010
MSW	At least 25% of all material presented at the kerbside is recycled.	50% of all material presented at the kerbside is recycled	75% of all material presented at the kerbside is recycled (if food waste is included)
C&I	5% increase in recovery and use of C&I materials	15% increase in recovery and use of C&I materials	30% increase in recovery and use of C&I materials.
C&D	20% increase in recovery and use of C&D materials	35% increase in recovery and use of C&D materials	50% increase in recovery and use of C&D materials.

However while the targets are set little or no supporting framework has been put into place to address the market failures and therefore based on the current scenario the targets are unlikely to be achieved as they will require the establishment of new systems and infrastructure for managing waste over the next decade. However, we can learn from our global neighbours.

Measuring resource efficiency necessitates a multi-criteria approach, but the best current data relates only to landfill diversion. Landfill diversion is a useful but crude measure of progress toward sustainability, because it does not discriminate between the benefits of keeping different materials out of landfills (compare the impacts of inert materials against hazardous materials). Better metrics might relate to categories of materials recycled but ideally should relate primarily to national strategy goals. Ultimately these goals need to be expressed in a way that relates to ecosystem services.

Landfill diversion or recycling rates have been useful indicators of our wastefulness. However, measuring eco-services, through ecodollars, conservation of embodied energy, or CO_2 emissions, would be a step towards metrics that are more fully related to life cycle impacts.

Other resource efficiency metrics and improvements will take longer, but are nevertheless important.

These include:

- amounts of virgin and recycled materials used in manufacture
- recycled content and embodied energy (similar to the energy and water ratings) within a given product
- totals of recycled content used and embodied energy at a state/territory and national level (this would allow comparisons of economic output per unit of resource input).

The purpose of these resource efficiency metrics is to better inform the net benefits approach to determining resource recovery options. In this way policy settings can be fine tuned to achieve higher resource value outcomes, contributing to continually improving levels of resource efficiency within society.

In ACOR's view the UK have got it right and are measuring the setting targets around the degradable material sent to landfill, the following section outlines their approach.

United Kingdom Case Study

The United kingdom has instituted a world leading system that has doubled household recycling in just 3 years. The driver is the European Commission's Landfill Directive which seeks to reduce the impacts of climate change and pollution. Given the potential of organics (paper, food and garden waste) to degrade in landfill, generating methane and contributing to global warming, the Landfill Directive seeks to reduce the degradable fraction being landfilled in the interests of sustainability and to improve resource recovery. Targets are based on the amount of organics landfilled which is measured in terms of Biodegradable Municipal Waste (BMW). In England each tonne of MSW is deemed to contain 68% or 0.68 tonnes of BMW. The UK targets require that by 2010 the amount of BMW going to landfill will be reduced to 75% of the 1995 figure, then to only 50% by 2013 and to just 35% by 2020.

The only way to realistically meet these targets is by rapidly building new infrastructure for recycling, composting and using Mechanical Biological Treatment (MBT) and incineration of MSW.

The government has introduced a range of complementary mechanisms to support these change including:

- **Landfill Tax:** Municipal waste is currently £18/T and rising by £3/T each year until £35/T. Inert and in active materials are charged £2/T. A clear differential based on environmental impact . These funds are used to stimulate investment eg
  - Waste Minimisation and Recycling Fund for local government recycling and composting programs, 2002-6 funding of £270 M available.
  - Business Resource Efficiency & Waste Program, 2005-8 £284 M available
  - 25 year loans to councils as Private Finance Initiatives £631 M available

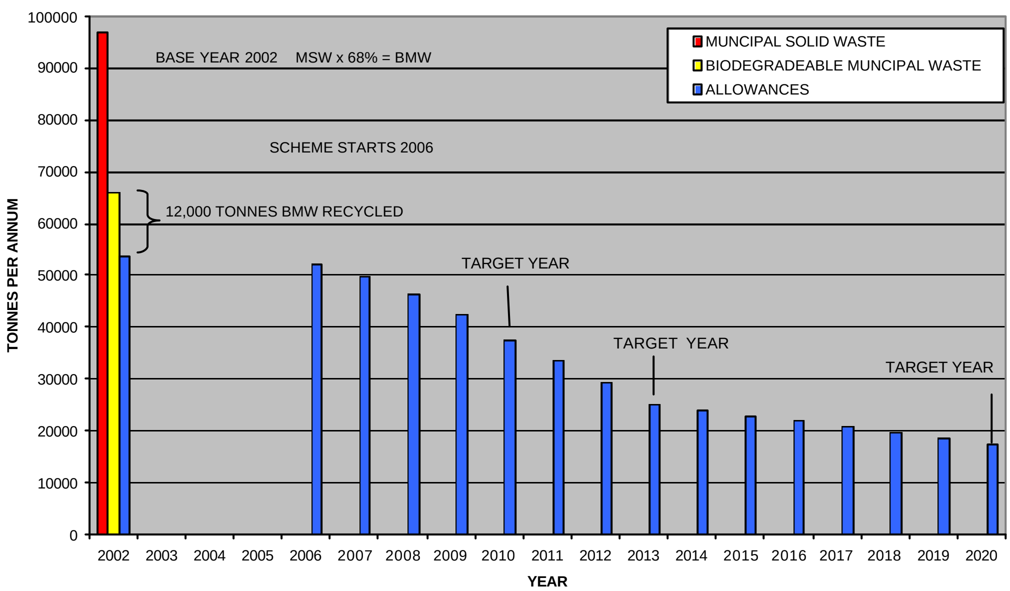
- **Aggregates Tax**: introduced to reduce the environmental impact from quarrying and to stimulate the rate of recycling of construction materials. All excavated materials e.g. sand, gravel and crushed rock except shale are taxed at £1.60/T.

- **Fines**: Should Councils exceed their BMW allowances, fines are **£150/T**

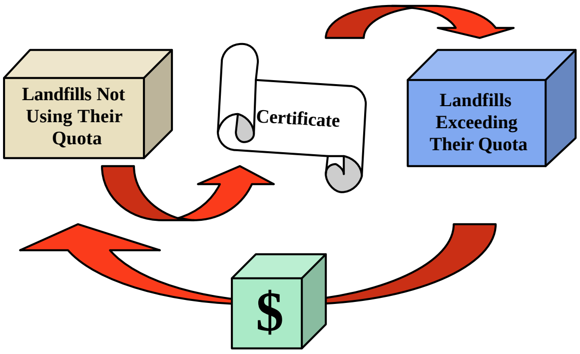
- **Landfill Allowance Trading Scheme (LATS) :** the world's first scheme started in April 2005 assigning every Waste Disposal Authority (WDA) an allowance for BMW to landfill for each year from 2005-6 to 2019-20. A WDA can establish infrastructure to meet allowance targets or bank, borrow or trade allowances.

  By way of example the current and future allowances for the Bath and NE Somerset Authority. Population 175,000, MSW generation 97,000 tonnes in 2001-2 with a 68% biodegradable content equates to 66,000 tonnes of BMW. However the region is already recycling 12,000 tonnes of BMW so the allowance is set at 54,000 tonnes reducing to 18,000 tonnes in 2019-20, irrespective of changes in population. Refer chart below.

LANDFILL ALLOWANCES FOR A WASTE DISPOSAL AUTHORITY



Should an Authority wish to trade, an electronic register of allowances is established and a Bulletin Board posts notices for buying and selling with price varying depending upon supply and demand. The first sale of landfill allocations recently took place in Hampshire where due to excess capacity it sold 138,000 tonnes of its 2005-6 allocation for £2.7M so the market price for reducing 1 tonne of BMW going to landfill is equivalent to A$47. It is likely the price will increase as compliance becomes harder over future years.



Lessons learnt for Australia?

- National targets are needed that drive recycling to reduce significant environment impacts such as resource depletion and climate change.
- Australian recycling will accelerate like UK recycling only to the extent that more recycling is better business than landfill .
- Targets for <u>each</u> year are very effective drivers. Because the Australian targets are mere visions, three or more state elections away, they are meaningless.
- Market based instruments really do make strategies work.
- Landfill taxes must be relevant to the potential for environmental harm to be meaningful.
- Taxes on residues from recycling and processing plants should be zero or only a small fraction of that for biodegradable material.
- Landfill Allowance trading Schemes provides infrastructure at minimum cost, as infrastructure will be placed where reduction in biodegradable matter can be achieved at the lowest cost.
- A substantial proportion of the revenues from landfill taxes must go back into the market place to stimulate ongoing investment.

The contrast with Australia couldn't be more obvious: our councils are financially encouraged to seek lowest cost landfill disposal, and are not rewarded for recycling ahead of any "target". UK councils are rewarded for recycling.

4. Achieving Greater Resource Recovery and Resource Efficiency

In a perfect world, there would be no waste and products and materials reaching the end of their useful lives, would still have sufficient intrinsic 'value' embedded in them to cover the costs of collection, dismantling and reprocessing to ensure their conversion into some sort of useful, new product.

Governments have recognised community concerns with unsustainable resource use and waste disposal, and have sought to reduce waste to landfill by various programs and sometimes the imposition of levies on landfill disposal. These are designed to make waste disposal less economic, but they sometimes have the unintended side effect of also making recycling less economic. Some state governments use these funds to stimulate community and council investment in recycling program, little if any is ever directed to the private sector and in the case of NSW for several years the entire levy fund of over 100 M per annum was diverted to consolidated revenue.

ACOR's position is that the best way to increase recycling is primarily to reward recycling. The level of recycling currently achieved is largely a result of the competition of recovered resources against equivalent virgin materials in the market for use in new products.

With the vagaries of the operation of commodity markets, there is a need to support recovered resources whenever market conditions become adverse, so as to maintain resource recovery performance. The best way to support these commodities is to internalise and capture the 'value' currently being given away for free to our community when these resources are recovered – the "Eco-Service". Essentially, there is a need for a market-based approach to valuing these environmental services and returning this to the sector to drive the delivery of even more ambitious resource recovery targets.

Rewarding recycling requires the establishment of a market for environmental services in the Resource Recovery Industry Sector. Such a market would provide the conditions necessary to meet government recycling targets and would encourage viability at the ambitious resource recovery levels adopted by Government.

ACOR supports a net benefits approach to choosing optimal resource recovery options (reuse, direct recycling, indirect recycling and energy recovery), to deliver resource efficiency outcomes but only if improved valuation methods are used in this assessment. Currently, recycling is constrained by a net benefits approach as it relies almost exclusively on commodity prices as the indicator of value.

This approach:

- does not value the positive eco-services that are provided by resource recovery
- does not account for negative externalised costs of waste disposal technologies.

To move forward in an environment of increased waste complexity, variability of materials and volatile commodity prices, resource efficiency needs to take into account the society-wide investment in materials and energy during the three major stages of a product's life cycle (pre-consumer, consumer and post-consumer). This differs from the current simplistic definition of improved resource efficiency as reducing waste associated with a given product or resource. A society can only become more resource efficient when it maximises the return on material and energy investments made across a product's life cycle (Attachment 1).

Improved valuation methods and metrics will create the situation where increased levels of resource efficiency always increase net benefits to society. The need for improved valuation mechanisms highlights the current market failure, which has delivered an over-provision of disposal and an under-provision of resource recovery.

5. Challenges to move to Greater Sustainability

5.1 Market Failure – Exclusion of Resource Recovery Eco-Service Benefits

The over-provision of disposal operations or landfills and under-provision of resource recovery services is a result of allowing resource recovery to develop in a distorted 'free market' that does not value 'eco-services'. This market failure can only be overcome by policy intervention that ensures the true valuing of 'eco-services' provided by the resource recovery sector. This would allow the sector to be adequately recompensed through a variety of mechanisms for the saved primary resources, energy savings, methane emissions, land pollution, leachate generation, human health and ecosystem impacts (amongst others) it provides (Attachment 2).

Use of the Ecodollar concept allows the valuing of these eco-services. Ecodollar estimates provide a dollar value based on:

- avoided water and air pollution
- avoided global warming potential
- resource conservation of mineral, forestry and water resources
- resource conservation benefits from composting and benefits from avoided solid waste (Attachment 4).

The overprovision of disposal services results in some 19 million tonnes of potential resources being wasted each year (see Attachment 4 for contributing calculations).

Using NSW estimates as a proxy for the national composition of disposed materials, the overprovision of disposal services destroys the opportunity to provide:

- in excess of $3.5 billon of eco-services to Australian society each year
- the annual recovery of $912 million of commodity value
- the annual recovery of 68,400 giga-watt hours (GWh) of embodied energy
- the direct creation of between 5,000 and 9,000 jobs (based on the amount of current employment within ACOR).

Further detail of these estimates is given in the table overleaf (see also Attachment 4 for further information).

(Note that this assessment is on the conservative side as it does not include any value from 'Other' due to the uncertain material composition, likely to comprise a mix of all material types. This category accounts for nearly one third of material disposal.)

Commodity	Tonnes Sent to Disposal	Commodity Value	Embodied Energy (GWh)	Eco$ Value
Paper	2,166,000	$151,620,000	21,900	$866,400,000
Glass	327,000	$23,544,000	1,200	$65,400,000
Aluminium	133,000	$199,500,000	6,300	$399,000,000
Ferrous	545,000	$40,875,000	4,800	$436,000,000
Plastic	1,228,000	$368,400,000	30,700	$1,228,000,000
Garden Organics	2,203,000	$44,060,000	300	$242,330,000
Food	2,248,000	$44,960,000	1,400	$314,720,000
Timber	944,000	$9,440,000	900	$75,520,000
Soil, Rubble, Concrete	2,953,000	$29,530,000	900	$59,060,000
Other	6,253,000	n/a	n/a	n/a
Total	**19,000,000**	**$911,929,000**	**68,400**	**$3,686,430,000**

ACOR supports an approach to economic efficiency that seeks to deliver the maximum value return (including social and environmental values) per unit of investment. In order to determine optimally efficient solutions, valuation mechanisms need to account for these additional values.

The above analysis demonstrates that the value provided by the resource recovery sector comprises not only the commodity value of recovered materials, but also savings in embodied energy and the provision of eco-services. However, the resource recovery sector will not be able to finance the delivery of these benefits unless they are recognised through mechanisms that directly benefit the recovery sector.

To do otherwise, will result in the resource recovery sector being forced to only concentrate on the commercial value within a distorted marketplace. This will discourage increased recycling and service delivery and will force the sector to ignore the higher waste/lower recovery materials and 'hard to treat' items that are fundamental to increasing current recovery rates. State Governments will lose the opportunity to deliver on projected waste targets, and the capacity of the environment to deliver services for future generations will continue to decline. This is far from an optimal result and highlights again the underlying contributing market failure.

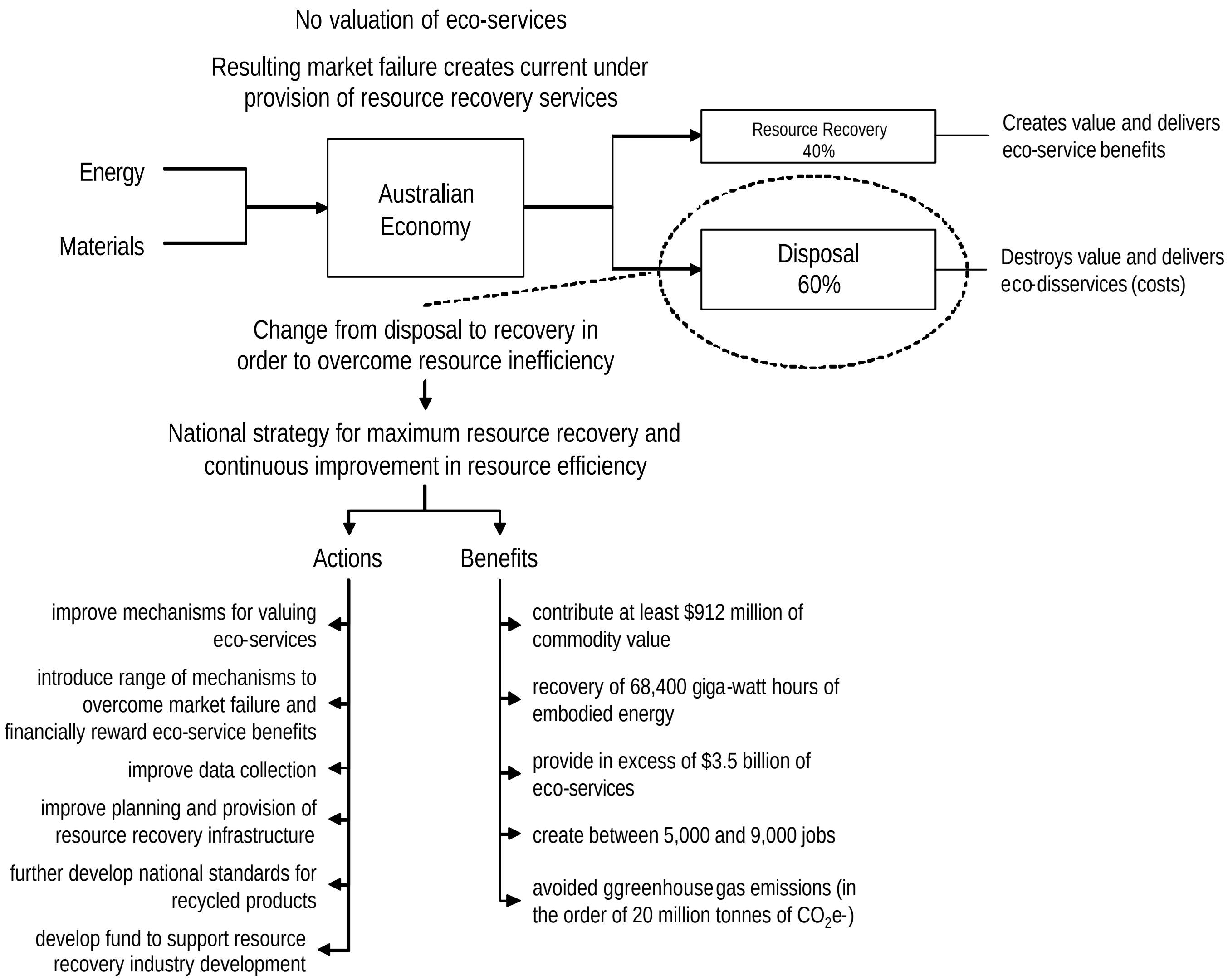
'Optimal approaches for resource recovery and efficiency and waste management'[3] should maximise resource recovery and have no place for any form of 'properly constructed and managed landfills and other types of waste disposal in Australia'[4] when the resources can be practically recovered. Regardless of the number of extractive voids requiring rehabilitation in Australia, disposal presents a negative return on the inherent material and energy investments within products and creates an enduring legacy of eco-disservices (including the long term pollution of the

[3] Inquiry into Waste Generation and Resource Efficiency – Terms of Reference #1

[4] Productivity Commission Issues Paper – Waste Generation and Resource Efficiency, page 20, http://www.pc.gov.au/inquiry/waste/issuespaper/waste.pdf

extractive void that was 'rehabilitated'). When environmental externalities are taken into account, any form of disposal is a sign of inefficiency within the economy and highlights areas where improvements must be made.

Adopting a national strategy of maximum resource recovery and continuous improvement in resource efficiency (as shown in the figure overleaf) has the potential to contribute to the economy at least $912 million of commodity value, recover 68,400 giga-watt hours of embodied energy and provide in excess of $3.5 billion of eco-services, in addition to between 5,000 and 9,000 jobs.



5.2 Reward Recycling Resource through Eco-service Benefits

In order for a net benefits approach to resource recovery and efficiency to operate effectively, there is a need for accurate accounting of all benefits and costs. In the Productivity Commission Issues Paper December 2005, it was claimed that 'benefits of disposing waste to landfill can include avoiding the need to resort to more costly alternatives'. This statement could only be true if all costs and benefits had been internalised into the assessment, with due consideration also given to community reaction and demands. Presently this is far from the case and improved methods of valuation that include eco-service benefits and disposal disservices are required. The logical long term impact of landfilling is that resources end up mixed in uneconomic concentrations and spread all over Australia. If nothing else, this is an intergenerational inequity.

In this submission ACOR has presented the eco-dollar method of valuation in order to demonstrate the magnitude of eco-services that are provided through resource recovery, and conversely the size of the opportunity that is lost through a reliance on disposal. Other methods of valuation could be developed, for example:

- expanding and refining the eco-dollar concept
- using an approach more closely based on ISO 14040 – Life Cycle Assessment
- basing the valuation purely on global warming potential, or CO_2 emissions.

An approach based on greenhouse gases could lead to a strategy of processing all materials prior to disposal to ensure that they were biologically inactive, and would also provide an opportunity to recover all metals, which have a high embodied energy content. This option would be a positive step in the right direction and could be further refined over time.

The importance of improving methods of valuation cannot be overstated as the present failure to account for externalities is causing a market failure that over-provides disposal disservices and under-provides resource recovery eco-services.

5.3 Mechanisms overcome market failure

With mixed wastes, it is in general artificially cheaper to waste the commodity value and embodied energy of materials than to return materials as secondary resource inputs into the economy. Because there is no reward for the eco-services provided by resource recovery, it is not profitable to recover resources from the more highly-mixed waste streams. Self funding mechanisms are required to overcome this market failure and reward the eco-service benefits provided by resource recovery.

There are many mechanisms that can be used to address current market failures that support the generation and disposal of waste. Those favoured by ACOR are presented below:

5.3.1 Extended Producer Responsibility (EPR) and Product Stewardship (PS) schemes for specific products

EPR and PS schemes can be effective mechanisms to recover select product types. There are many examples of schemes in operation or under development in Australia, including (amongst others):

- the Used Oil Stewardship Program
- the National Packaging Covenant
- development of a national approach for recycling of tyres and electronics.

Approaches could include the implementation of 'deposit' legislation applied to both materials and complex products to facilitate multi-material processing and recovery or an EPR/PS payment at point of sale, with graduated benefit payments made on the sale of recycled commodity, relative to highest resource value and scaled according to the delivery of eco-service benefits.

ACOR supports across the broad deposit schemes such as advance disposal or recycling fees but does not support restricted CDL or deposits schemes applied in a partial manner.

There are many opportunities to develop additional EPR/PS schemes, however these must be done on a national basis. Resource recovery statistics become readily available under such schemes and can be used to benchmark manufacturers and encourage resource efficiency in product lines.

5.3.2 *Market Based Instruments (MBIs) such as tradeable certificates*

MBIs such as tradeable certificates have the following advantages:

- can be applied to broader material types or waste streams
- act to directly increase resource recovery
- address the materials that EPR and PS schemes do not cover
- have existing Australian parallels such as Renewable Energy Certificates or NSW Greenhouse Gas Abatement Certificates.

The principle of recognising and rewarding the eco-service benefits that resource recovery provides should be starting point for an MBI, whatever the chosen mechanism.

5.3.3 *Standardisation of waste levies across Australia*

Waste levies act as a final disincentive to disposal for those products and materials not captured under EPR/PS and tradeable certificate MBIs. However, undifferentiated levies used primarily to raise revenue (as applied in NSW) have the following consequences:

- do not differentiate on the basis of environmental impact (for example the same levy is applied to one tonne of concrete as to one tonne of electronic scrap, although the environmental impact is markedly different)
- do not directly increase or reward recycling as they act only to punish waste disposal
- represent a 'bottom line' cost to recyclers for the management of recycling residues
- may decrease recycling of commodities that are currently only marginally economic (for example the recycling of cars in rural and regional locations) and hence reduce potential eco-service benefits
- act as an economic disincentive for innovative improvements in recovery where it is currently either technically impossible or uneconomic

- carry the risk of increased illegal dumping and other litter
- requires additional regulatory authority with the legal ability to prosecute offenders.

As part of the standardisation of levies it is imperative that monies raised through levies are hypothecated to support resource recovery and to ensure that recycling operations are not negatively impacted through increased costs. The NSW levy is uniformly imposed on all forms of waste to landfill (no matter what their environmental impact) on the basis of simplicity of administration, which will almost certainly lead to adverse environmental outcomes.

5.3.4 Disposal bans on certain materials, products or waste streams
A progressive phase-in of disposal bans for materials with high levels of eco-disservices, combined with an accompanying penalty payment for non compliance would act to improve technology developments and attract investment in resource recovery.

5.3.5 Apply similar subsidies as for virgin primary resources
There are many subsidies available to primary resource producers including (amongst others):

- diesel excise exemption
- low cost electricity
- tax breaks
- accelerated depreciation
- permission to dispose of materials on-site with no penalty.

These subsidies, to an estimated $5.7 billion per year,[5] put secondary resources at a competitive disadvantage and should be extended to apply to resource recovery.

5.3.6 Inclusion of process heat in support for renewable energy
Many Energy from Waste opportunities rely on the provision of process heat, for example the use of process engineered fuels in cement kilns. These opportunities are placed at a competitive disadvantage to options that produce electricity, even though energy recovery as process heat is more thermally efficient than electricity generation. Process heat is excluded from initiatives such as the Mandatory Renewable Energy Target, where Renewable Energy Certificates (RECs) can only be created from electricity generation. Additional support for 'process' Energy from Waste is required to support the positive eco-service contribution it can make to renewable energy.

5.3.7 Promotion of 'Design for Recovery' *to product designers and manufacturers*
Decisions made at the point of product design and manufacture can greatly influence the opportunities for resource recovery at a product's end-of-life. However there is no feedback loop with designers to influence product design. Required activities include:

[5] Nolan ITU 2001 'Independent Assessment of Kerbside Recycling' http://www.packcoun.com.au/NPC-FINAL-01.PDF

- an education programme (at a minimum)
- rewards for products designed to facilitate resource recovery
- penalties for those manufacturers with products unable to be recovered.

As a starting point to investigating the range of mechanisms that could be employed to overcome current market failures, ACOR suggests an examination of schemes in operation in the United Kingdom and an assessment of their suitability for rewarding eco-services in the Australian context. For example:

- Landfill Allowance Trading Scheme (LATS)
- Packaging Recovery Notes (PRN)
- differentiated landfill tax on the basis of whether the material is biologically active or inactive
- Aggregates Levy.

5.4 Improve data collection for determining resource efficiency

Australia does not yet have sufficient data quality to support informed business decisions across all resource recovery sectors.

Accurate information is needed to support an informed decision process for the future of the industry, for example, in setting priority areas for Extended Producer Responsibility and Product Stewardship schemes, identifying infrastructure investment opportunities and measuring progress made in resource efficiency.

We also need to measure our levels of waste generation and disposal against other countries so that best practice performance can be identified and achieved (while noting that international strategies may not be directly applicable in the Australian context).

States and territories should report on the basis of a common methodology for data collection, which should include:

- volumes and types of waste disposed of to landfill or other disposal technologies (including the removal of 'Other' as a reporting category)
- volumes and types of resource recovery
- data reported in tonnes, as opposed to percentages, as increasing recovery percentages can hide increasing disposal volumes if combined with increases in the rates of waste generation
- disaggregation of 'mixed' material recovery, for example identification of the composition of mixed bales of plastics being exported for 'recycling'.

The volumes of materials recovered and disposed of are only part of the resource efficiency equation. As improvements are made in developing resource efficiency metrics, so too should data collection improve to keep track. Additional information required includes:

- volumes of virgin and recycled materials used in manufacture
- measurements of recycled content and embodied energy (similar to the energy and water ratings) for given product and also at a state/territory and national level

- time series comparisons of economic output per unit of resource input to track progress made in improving resource efficiency.

5.5 National Standards for Recycled Products

Recovered resources are often discriminated against on the basis of being 'recycled', rather than being assessed on their performance. This is a significant barrier to local market growth. The development of national standards to assure secondary resource performance and allow comparison with other commodity choices are needed to overcome this barrier. The work begun by ACOR on the development of standards for recyclable materials needs to be extended across all significant material types.[6]

Also required is a change in tender evaluation practices by local government to allow the meeting of material specifications on the basis of performance, as opposed to being a 'virgin' material. Being prescriptive on performance is naturally the consumer's right, however there should exist an equal opportunity for secondary resources to compete on performance. This is especially the case where recycled content can outperform competing domestic and imported resources, but is not chosen because of 'waste' connotations. All materials should be selected on their ability to confirm to a performance specification.

5.6 Fund to support Resource Recovery Industry Development

All of the major primary production industries have benefited from decades of government support in the form of grant programmes, funding support for research and development corporations, university research programmes and cooperative research centres. Compared to this the level of industry development support for resource recovery at a national and state level has been negligible.

ACOR recommends that a fund be established to support technology and innovation development within the resource recovery industry, similar in operation and scale to the support given for renewable energy. This is an essential 'level playing field' requirement for resource efficiency in Australia and would need to be under the control of a multi-interest board and subject to independent audit.

To complement the operation of this fund and as a separate initiative, it is recommended that a Resource Recovery Research and Development Corporation be established, to work towards the advancement of a profitable, competitive and sustainable resource recovery industry that contributes to Australia's resource efficiency.

[6] Please see www.acor.org.au/materials.html for more information on material specifications developed by ACOR for paper, aluminium, glass, plastic and steel.

Attachments

Attachment 1

Value Chain, Resource Efficiency and Highest Resource Value

The supply chain traditionally refers to the linear flow of physical resources from extraction through manufacturing, assembly service life and to final disposal. This is contrasted with the 'value chain', which includes any element that can add, retain or subtract value from a product, from point-of-initiation to end-of-life management.[7] The value chain, in addition to physical material flows, also incorporates flows of energy, finance and environment impacts, combined with flows of information, ideas and decisions. Furthermore, 'value' incorporates environmental and social values, in addition to economic considerations.

The value chain can be divided into three elements including pre-consumer, consumer and post-consumer (see figure below). At the pre-consumer stage, resource efficiency refers to the usage of materials and energy to manufacture a given product. A product is said to be more resource efficient when less physical and energy resources are used in manufacturing and the same level of functionality is maintained.

Overall resource efficiency is also affected by the use (or mis-use) of products during their service life. This aspect of resource efficiency, while important, is beyond the scope of the Waste Generation and Resource Efficiency Inquiry and has not been addressed here.

The post-consumer end-of-life management choice determines the fate of the resource value of 'invested' physical materials and energy. The resource efficiency of our society as a whole is greatly determined by post-consumer outcomes, that is, the value returned to the economy through the resource recovery of embodied material and energy investments. Disposal always gives a zero return on investment.

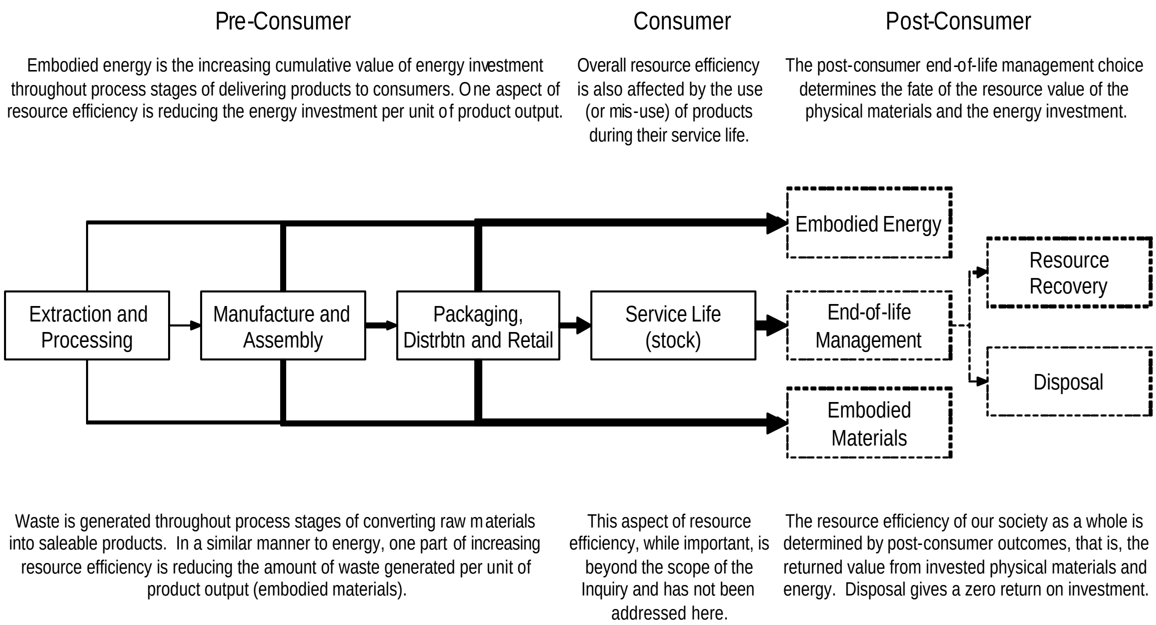


Figure – Resource efficiency of material and energy flows throughout a product's life cycle

[7] For a discussion on value chain considerations related to waste generation and resource efficiency see Warnken ISE (2004) 'Market Based Instruments and Sustainable Resource Recovery' (http://www.tec.org.au/member/tec/projects/Waste/mbir1.html - pg 30-31) and GHD & Warnken ISE (2005) 'Discussion Paper on the Theoretical Concepts and Potential Surrounding Extended Producer Responsibility and Product Stewardship' (http://www.wmaa.asn.au/efw/task36.pdf - pg 18-23).

The goal of resource efficiency is to maximise the return on material and energy investments made in manufacturing products. The pre-consumer aspects of this equation relate to reducing energy usage, material inputs and waste generation per unit of production output. The post-consumer aspects of the resource efficiency equation relate to recovering resources at their highest resource value, which is a net benefit approach to determining resource recovery options.

Highest resource value is a net benefit approach on the basis of environmental, social and economic values. Consideration needs to be given to the recovery options for the material in question, their commercial status and accessibility, the economic, environmental and social case for available and accessible recovery options and the prevailing local conditions (for example, drought, energy shortage, saline soils etc).[8]

This approach has an immediate connotation of maximising the good (value adding) and minimising the bad (lost value and pollution) for recycling options. While difficult to quantify, highest resource value choice is immediately obvious in some instances, for example using recovered 100 year old hardwood beams for furniture manufacture as opposed to energy generation. Highest resource value is also seen in action in the Australian Product Stewardship for Oil (PSO) Program that has a scaled series of PSO benefits that are paid on the basis of producing a higher value recovered oil product.[9]

Applying highest resource value thinking at a regional level counters the law of diminishing returns as an excuse for increased waste disposal. This law states that increased rates of recycling become progressively more expensive. For example, increasing the rate of recycling of newsprint beyond current levels will incur additional capital and running costs, as well as creating increased contamination levels associated with the recovered newsprint. This reasoning leads to the conclusion that 'increasing the rate of recycling will not necessarily be environmentally or economically sensible'.[10]

However, this argument only holds when considering the direct recycling of a single commodity, as shown in the figure below. Highest resource value principles will select a different resource recovery option that fits the given circumstances. These options include reuse, direct recycling, indirect recycling and energy recovery.

'Maximum resource recovery' can be achieved when all that is left from an array of various recovery technologies is 'fully mineralised' materials (that is, no longer biologically active or leachable) that have as their highest resource value the remediation of quarries and other voids needing rehabilitation. In this way an optimal level of resource efficiency can be delivered to society on the basis of integrated post-consumer resource recovery.

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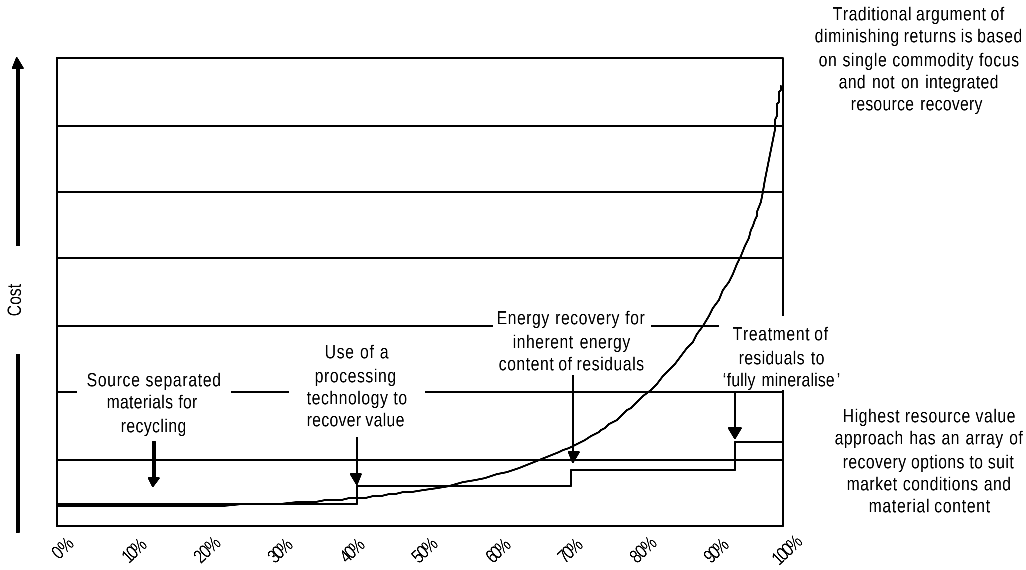
8 Warnken ISE (2004) 'Market Based Instruments and Sustainable Resource Recovery' (http://www.tec.org.au/member/tec/projects/Waste/mbir1.htm l - pg 32 - 33)

9 For a list of the Product Stewardship Oil benefits see http://www.oilrecycling.gov.au/benefits.html.

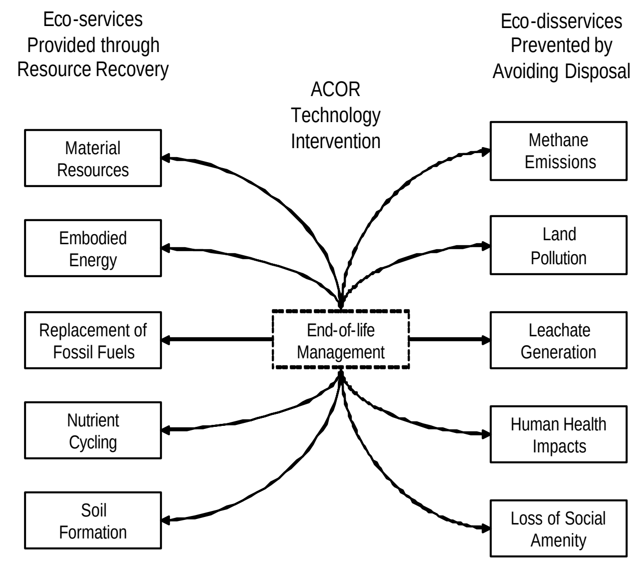
10 'Waste Generation and Resource Efficiency Issues Paper' - http://www.pc.gov.au/inquiry/waste/issuespaper/index.html


Traditional argument of diminishing returns is based on single commodity focus and not on integrated resource recovery
Cost
Energy recovery for inherent energy content of residuals
Treatment of residuals to 'fully mineralise'
Use of a processing technology to recover value
Source separated materials for recycling
Highest resource value approach has an array of recovery options to suit market conditions and material content
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

Attachment 2

Resource Recovery Eco-Services and Disposal Disservices

The technology interventions provided by ACOR members at a product's end-of-life disrupt the linear flow of resources and energy into landfill. Recycling provides economic benefits by returning to the economy a range of material and energy inputs; creates a significant amount of employment; provides a range of eco-services based on the flow on effects of reduced energy usage and material substitution; and prevents a number of eco-disservices from occurring by preventing pollution.



The eco-services provided by the Australian resource recovery industry (see opposite figure) occur regardless of financial impacts. These eco-services include the provision of material resources, high embodied energy content, non-fossil fuels nutrient cycling, soil formation and cultural value. The eco-disservices prevented by resource recovery include the emission of methane, pollution of land, generation of leachate, impacts on human health, and overall loss of social amenity. The table below summarises the case for the eco-services provided by resource recovery.

Table – Summary of eco-services provided through resource recovery

Eco-service	*Description*
Provision of material resources	By recovering secondary resources and processing these into material inputs for manufacturing there is a reduced demand for primary resources, which slows the rate of resource depletion. Secondary resources also prevent the associated pollution arising from primary resource extraction, processing and refining.
Recovery of embodied energy	Embodied energy refers to the cumulative energy used along the supply chain to transform a raw material into a final product. Recycling captures that embodied energy and lowers the energy requirements for products with recycled content, reducing energy demands at a societal level and increasing the overall energy efficiency of manufacture.

Replacement of fossil fuels	The recovery of inherent energy (calorific value) from those materials unsuitable for recycling directly or indirectly into other products, has the benefit of displacing fossil fuels. Australia's electricity supply is dominated by fossil fuels including black coal, brown coal and gas. These fossil fuels are responsible for approximately one-third of all of Australia's GHG emissions.
Nutrient cycling	The processing of organic materials such as food and garden materials into fertiliser and compost products returns valuable nutrients to the soil.
Soil formation	As a continent Australia has very little top-soil and what is present has taken thousands of years to develop. Processing excavated soil from construction sites and garden organics can produce a top-soil product.
Prevention of methane emissions	The anaerobic decomposition of bio-degradable material in landfills produces methane (amongst other gases). Methane is a greenhouse gas with a global warming potential 21 times that of carbon dioxide. Even the best landfill gas collection systems in the world will not recover all of the methane. Furthermore, fugitive methane emissions will continue to be released long after the landfill is closed, and any attempts to 're-mine' old landfill sites will incur a significant carbon loading when any trapped methane is released.
Prevention of land pollution	There are no benefits arising from disposal as disposal returns no value from embodied material and energy investments within 'wastes'. The indiscriminate disposal of materials creates a variety of legacy problems. Closed landfill sites are not 'geologically' sound and will continue to subside over time, reducing future land use options. There is a need to rehabilitate extractive voids, however this should be done with materials that have civil applications as their highest resource value and are fit-for-purpose, that is compactable, inert and unlikely to leach.
Prevention of leachate generation	Leachate refers to water that has percolated through waste in landfills and become contaminated. Leachate contains soluble substances including chemicals and heavy metals, in addition to particles and micro-organisms and can potentially contaminate water bodies if not properly captured and treated.
Mitigation of human health impacts	The operation of disposal facilities presents a number of human health impacts related to air, land and water pollution, in addition to the creation of dust, air-blown litter, breeding grounds for vermin and toxic fumes (in the case of landfill fires).
Preservation of social amenity	The combined impacts of disposal facilities results in a loss of social amenity. No community wants to host a waste dump. Conversely there is widespread community support for resource recovery outcomes.

Attachment 3

Value of Eco-Services Provided and Eco-Disservices Prevented

In January 2001 an Independent Assessment of Kerbside Recycling performed by consultants Nolan ITU (now Hyder Consulting), SKM Economics and EnvirosRIS was published by the National Packaging Council.[11] This report provided an indication of the environmental costs and benefits associated with recycling a bundle of kerbside collected materials and derived estimates of the 'eco-dollar' net benefit for individual materials. This methodology was also used to inform a discussion paper on Rewarding Recycling: Eco-Services from the Resource Recovery Industry - A Market Based Approach, also by Nolan ITU (now Hyder Consulting).

Eco-dollar estimates provide a dollar value estimate of the eco-services provided by resource recovery based on avoided water and air pollution, avoided global warming potential, resource conservation of mineral, forestry and water resources, resource conservation benefits from composting and benefits from avoided solid waste.[10] The indicative eco-dollar values of recycling a variety of materials is presented in the table below.

Table – Summary of eco-dollar benefits from material recycling[12] (or of eco-value lost if sent to disposal)

Commodity	*Eco$/t*
Paper	400
Glass	200
Aluminium	3,000
Steel Cans	800
High Density Polyethylene (HDPE)	1,000
Polyethylene Terepthalate (PET)	1,000
Garden Organics	110
Food	140
Timber	80

Another way of expressing the eco-dollar equation is to note that for every tonne of aluminium disposed of to landfill there is an estimated loss of $3,000 of eco-service benefits that could have been provided to Australian society through resource recovery.

The lack of accounting for the eco-services provided by resource recovery is a market failure that has resulted in the under provision of recycling services and the overprovision of disposal disservices.

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[11] http://www.packcoun.com.au/NPC-FINAL-01.PDF

[12] Rewarding Recycling: Eco-Services from the Resource Recovery Industry - A Market Based Approach, prepared by Nolan ITU (now Hyder Consulting) for ACOR

Attachment 4 Impacts Arising from the Overprovision of Disposal Disservices

It is often argued that most environmental pollution, natural resource depletion and disruptions to ecosystem services are caused by market failure, in particular the ability of firms to gain a competitive advantage by externalising the costs of their pollution onto the environment and community.[13] This results in an over provision of primary resources and an under provision of secondary resources.

Additionally the inability of eco-service providers to gain financial reward makes competing against disposal difficult. Again, the result of this market distortion has resulted in an under provision of resource recovery services and an over provision of disposal disservices. The current distorted market place is one that encourages and financially supports waste companies and actively works against resource recovery operations. This is demonstrated by the current levels of waste generation and subsequent disposal in Australia, presented in the table below.

Table – Impact of market failure: over provision of disposal

Jurisdiction	*Total Waste Disposal (t)*	*Total Recycled (t)*	*Total Waste Generated (t)*	*Rounded Population*[14]	*Waste Disposal per capita (t)*
New South Wales[15]	6,341,000	5,828,500	12,169,500	6,715,000	0.944
Victoria [16]	4,460,000	4,010,000	8,470,000	4,950,000	0.901
Queensland[17]	3,866,278	992,493	4,858,771	3,840,000	1.007
Western Australia (Perth)[18]	2,540,805	134,250	2,675,055	1,970,000	1.290
South Australia [19]	1,006,000	2,147,000	3,153,000	1,530,000	0.658
Tasmania [20]	497,000	n/a	497,000	480,000	1.035
Australian Capital Territory [21]	208,390	500,279	708,669	325,000	0.641
Northern Territory Darwin)[22]	82,500	10,000	92,500	200,000	0.413
Total	**19,001,973**	**13,622,522**	**32,624,495**	**20,010,000**	**0.950**

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13 See Warnken ISE (2004) 'Market Based Instruments and Sustainable Resource Recovery' (http://www.tec.org.au/member/tec/projects/Waste/mbir1.html) for a discussion on externalities within the context of resource recovery.

14 http://www.abs.gov.au/ausstats/abs@.nsf/lookupMF/8CA5022B2135F162CA256CD0007BEE2202-03

15 http://www.resource.nsw.gov.au/data/strategy/Progress%20report_web_inc%20cover_V2.pdf

16 00-01 http://www.ecorecycle.vic.gov.au/asset/1/upload/TZW_-_Appendix_A_-_Supporting_Analysis_to_the_Strategy_&_Plan_(2003).pdf

17 01-02 http://www.epa.qld.gov.au/register/p01258cg.pdf

18 03 http://portal.environment.wagov.au/pls/portal/docs/PAGE/DOE_ADMIN/POLICY_REPOSITORY/TAB1144266/1862_STRATEGIC_WASTE_0308.PDF and http://www.wastewa.com/Uploads/Images/Waste%20to%20Landfil%20-%20Perth%20Metropolitan%20Region.pdf for recycling estimate

19 03 http://www.zerowaste.sa.gov.au/pdf/0510_strategy_background.pdf

20 04 personal communication Mark Cretney DPIWE 2005

21 03-04 http://www.nowaste.act.gov.au/styles/landfillgraphpdf.pdf and http://www.nowaste.act.gov.au/styles/actresourcerecovery.pdf

22 04 personal communication Anegelika Hesse Darwin City Council 2005

Notwithstanding gaps in data (such as missing recycling data from Tas. metropolitan data acting as a proxy for WA and NT, and a likely under reporting of waste generation in Queensland), there are some 19 million tonnes of urban waste materials disposed of each year, representing nearly 60% of waste generation.

Disposal is essentially a value destroying activity. Disposal is contrasted against resource recovery activities that are focused on quality and use technology interventions to manufacture saleable commodities. The goal of recycling is the extraction of maximum resource value from materials that previously were wasted. This contribution to a loss of resource efficiency at a society level can be estimated as the market commodity value of materials wasted, the lost energy investment (embodied energy) and the lost eco-dollar benefits. The impacts of the market failure perpetuating this loss of value to Australian society are presented in the table below.

Table – Summary of lost value arising from the disposal of materials in Australia

Commodity[23]	*Tonnes Sent to Disposal*[24]	*Commodity Value*[25]	*Embodied Energy*[26] *GWh)*	*Eco$* **Value**[27]
Paper	2,166,000	$151,620,000	21,900	$866,400,000
Glass	327,000	$23,544,000	1,200	$65,400,000
Aluminium	133,000	$199,500,000	6,300	$399,000,000
Ferrous	545,000	$40,875,000	4,800	$436,000,000
Plastic	1,228,000	$368,400,000	30,700	$1,228,000,000
Garden Organics	2,203,000	$44,060,000	300	$242,330,000
Food	2,248,000	$44,960,000	1,400	$314,720,000
Timber	944,000	$9,440,000	900	$75,520,000
Soil, Rubble, Concrete	2,953,000	$29,530,000	900	$59,060,000[28]
Other[29]	6,253,000	n/a	n/a	n/a
Total	**19,000,000**	**$911,929,000**	**68,400**	**$3,686,430,000**

[23] Due to a lack of disaggregated data on a national basis, NSW estimates have been used as a proxy for the waste disposal composition for all of Australia, and so these estimates are presented for illustrative purposes only - http://www.resource.nsw.gov.au/data/strategy/Progress%20report_web_inc%20cover_V2.pdf

[24] Combined available estimates from State and Territory sources as calculated in the preceding table and rounded to nearest 10,000 tonnes

[25] Hyder Consulting 2005, 'Rewarding Recycling: Eco-Services from the Resource Recovery Industry - A Market Based Approach', prepared for ACOR

[26] Rounded to the nearest 100 giga-watt hours (GWh – 3,600 giga-joules (GJ) – 1 GWH). Source data from Technical Manual Design for Lifestyle and the Future (2004) - http://www.greenhouse.gov.au/yourhome/technical/fs31.htm and Centre for Building Performance Research (1995) - http://www.vuw.ac.nz/cbpr/documents/pdfs/ee-coefficients.pdf. In GJ/tn, Paper = 36.4, Glass = 12.7, Aluminium = 170, Steel Virgin = 32, Plastics General = 90, Garden Organics – air dried sawn hardwood used as proxy = 0.5, Food from http://www.steppingforward.org.uk/tech/compbycomp.htm conservative average of Pulses 5, Cereals 4, Starchy root 2, Vegetables 1, Fruits 1, Eggs 1 = 2.3, Timber average of Kiln dried sawn softwood 3.4, Kiln dried sawn hardwood 2.0, Air dried sawn hardwood 0.5, and Particleboard 8.0 = 3.5, Soil, Rubble, Concrete average of loc al stone 0.8, sand 0.1, concrete ready mix 17.5MPa 1.0 and clay bricks 2.5 = 1.1.

[27] Hyder Consulting 2005, 'Rewarding Recycling: Eco-Services from the Resource Recovery Industry - A Market Based Approach', prepared for ACOR

[28] A surrogate estimate has been used for the eco-dollar benefits of soil, rubble and concrete from Triple-Bottom-Line Assessment of Global Renewables UR-3R Resource Recovery Technology - http://www.nolanitu.com.au/__data/page/10/3BL_Assessment_of_UR3R3.pdf - values used were for avoided landfill amenity & intergenerational equity values of $9.35 per tonne for metropolitan centres and resource conservation of sand mineral resources of $10.37 per tonne, rounded to give $20 per tonne.

[29] Note that the above assessment does not include any value from 'Other' due to the uncertain material composition, likely to comprise a mix of all material types. This category accounts for nearly one third of material disposal. This means that the benefits outlined above are a conservative estimate based on the value of two thirds of waste material flows.

The 19 million tonnes of materials disposed of represents a significant loss of value including an estimated:

- $912 million in material commodity sales
- 68,400 giga-watt hours (GWh) of embodied energy, which is equivalent to almost one third of electricity generation in Australia[30] (although note that embodied energy includes other energy sources other than electricity, for example solid and liquid fuels)
- more that $3.5 billion of eco-service benefits
- 5,000 to 9,000 jobs.[31]

30 Total electricity generation in Australia 2003/04 approximately 213,000 GWh - http://www.esaa.com.au/store/page.pl?id=1581

31 ACOR currently employs more than 5,000 people in the recovery of 11,300,000 tonnes of resources. A similar amount of labour would be necessary to recover all of the material components currently going to disposal – excluding the 'Other' amount of 6,253,000 tonnes. To recover these materials as well, based on current employment levels, an additional 4,000 employees would be needed.

Attachment 5

Definition of Key Terms

Commercial and Industrial (C&I) Waste	Waste materials generated from fixed point sources related to manufacturing, wholesale, retail, professional services and administration sectors. C&I along with C&D and MSW make up urban waste.
Construction and Demolition (C&D) Waste	Waste materials generated from construction and demolition activities both on a large scale (high rise) and a small scale (residential housing). C&D along with C&I and MSW make up urban waste
Direct Recycling	Recycling waste materials into resources for use in manufacturing a new product within the same supply chain (also know as closed loop recycling). For example recycling a PET plastic bottle into a new PET plastic bottle.
Economic Efficiency	Economic efficiency refers to an optimal balance between production and consumption achieved where the cost of producing an additional unit of production or service (marginal cost) is equal to the price the market is willing to pay. Economic efficiency can also refer to maximising the value of outputs from resources, achieving the lowest cost of production, or from a policy perspective, returning the greatest social or environmental benefits for the least social or environmental costs. In the context of waste generation and resource efficiency three approaches to economic efficiency are identified on a cost, commodity and value basis. Firstly, using cost as the starting point, economic efficiency in waste generation would occur when the cost of avoiding or recovering a unit of waste is equal to the cost of landfill disposal. If landfill is artificially cheap then resource recovery and waste avoidance will be underprovided, while if landfill is artificially expensive, then recovery services will be overprovided. The key issue here is the pricing of landfill. Secondly, using commodity prices for recycled materials, economically efficient levels of recycling occur when the cost of delivering an additional unit of recyclate is equal to the price the market is willing to pay. However, the market could be artificially depressed through a lack of competition, or pegged against primary resources with externalised costs of production and financial subsidies to support production. Once again the issue of pricing is key, this time in ensuring that competing products do not have an unfair competitive advantage. Thirdly, arguing from a value approach, economic efficiency is achieved by calculating per unit value returns from a range of different investment options. For example, the value returned by sending materials to disposal (arguably zero or negative) versus the value returned through resource recovery (commodity, embodied energy and eco-dollars). If these values are not identified and brought to account in the policy making setting, an underinvestment in resource recovery services will result in a net loss of value to society.
Ecodollars	Ecodollar estimates are a means of converting the eco-services benefits provided by resource recovery into a dollar value estimate. The methodology is based on valuing avoided water and air pollution, avoided global warming potential, resource conservation of mineral, forestry and water resources, resource conservation benefits from composting and benefits from avoided solid waste. Converting these values into a dollar 'indicator' allows more direct comparison with traditional cost-benefit assessments.

Eco-services	Ecosystem services (eco-services) are the range of services provided by the ecosystem (biosphere), including atmosphere and climate maintenance, water regulation and supply, biodiversity and genetic resources, soil formation, raw materials, and food production. Here eco-services denote the positive contributions to ecosystem operation made by resource recovery activities.
Energy from Waste	Energy from Waste (EfW) is the recovery of the calorific value of a waste material through a range of technology processes such as combustion, anaerobic digestion, gasification and carbonisation. EfW seeks to maximise the recovered energy as the primary purpose of the operation as opposed to incineration, which has the destruction of waste materials as the primary purpose.
Indirect Recycling	Processing waste materials into resources for use in manufacturing a new product within a different supply chain (also know as open loop recycling). For example recycling a PET plastic bottle into a new 'poly-fleece' jacket.
Market Based Instruments MBIs	Market based instruments (MBIs) seek to harness market forces to assist in meeting a desired environmental goal. Such instruments include charges, fees and taxes, market creation (such as the establishment of tradeable permits/certificates), subsidies, deposit/refunds and improving the operation of the market through non-financial means, such as information provision. Here MBIs are used to identify tradeable permit and certificate schemes.
Market Failure	The operation of western economies is predicated on assumptions of perfect 'free-market' competition. When a market is not perfectly competitive, it is said to have suffered 'market failure'. Some contributing causes of market failure include monopolistic power (small numbers of buyers and sellers), influences of branding on purchase decisions, locational or geographic commercial advantages, barriers to industry entry, other 'non-price' advantages (eg. from excessive advertising), price fixing, incomplete or imperfect knowledge, public goods and the presence of externalities. It is often argued that most environmental pollution, natural resource depletion and disruptions to ecosystem services are caused by market failure, in particular the ability of firms to gain a competitive advantage by externalising the costs of their pollution onto the environment and community.
Municipal Solid Waste (MSW)	Waste materials that are primarily generated from the domestic sector and are collected in household garbage, recycling, garden organics and Council clean-up collections (for bulky household waste such as appliances and furniture). MSW also includes other types of waste such as household hazardous waste and waste generated from local Council operations, for example waste from street sweeping, litter bins and parks. MSW along with C&I and C&D make up urban waste.

Resource Efficiency	A notional measurement of the materials and energy used to manufacture products. Resource efficiency can be applied at a single product level and also at a whole of society level. A product is said to be more resource efficient when less physical and energy resources are used in manufacturing and the same level of functionality is maintained. A society is more resource efficient when it maximises the return on material and energy investments made in manufacturing products by recovering their highest resource value at end-of-life. Also known as resource productivity, the concept is contrasted against labour productivity, which has been driving the focus of industrialised economic development, namely the increased production per unit of labour. Labour productivity is associated with increased resource and energy intensity and has been over provided in many western economies because subsidies to primary resources and externalised costs have kept resource prices artificially low.
Resource Recovery and Recycling	The process of transforming wrong time/place materials (waste) into right time/place resources (value) through a range of technologies (processes, practices and procedures). The 'new' products result from reuse, direct recycling, indirect recycling and energy from waste. Here the terms resource recovery and recycling are used interchangeably.
Re-use	Re-use refers to taking waste materials or products and re-using them in their same form for the same or similar function, with minimal or no processing.
Urban Waste	Urban waste is a grouping term referring to all waste generation within an urban context (MSW, C&I and C&D), as opposed to agriculture, mining or other primary resource activities. Urban waste materials are created both during pre-consumer activities - as by-products from production, manufacturing and sometimes distribution - and during the post consumer phase, which includes fast moving consumer goods, end-of-life appliances and other unwanted materials discarded by the consumer or resident.
Waste Generation	Waste generation refers to the total amount of materials that have no further use to the current owner and thus present as a problem requiring removal. Total amounts of waste generated in any given region are calculated as the total waste disposed, plus the total amounts of materials recycled (net of any residue requiring disposal).
Waste Management Hierarchy	The waste management hierarchy is a well known public policy 'mantra' built around the three 'Rs' of reduce (or avoid), reuse, and recycle. Variations include the addition of reprocessing, recovery of energy and treatment. Preference is given to avoidance in the first instance and disposal as a means of last resort. Difficulties arise when the hierarchy is used as an implementation plan for sustainable resource recovery, as a linear interpretation of the hierarchy is unlikely to consistently yield the most sustainable outcome.